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JC20 Rec'd PCT/PTO 30 JUN 2005

A DEVICE FOR A PULLING TOOL FOR USE IN PIPES AND BOREHOLES
FOR THE PRODUCTION OF OIL AND GAS

This invention relates to a pulling tool, in particular for
use in the positioning of equipment and acquisition of meas-
5 ured data in pipelines and boreholes for the production of
oil and gas.

In long pipelines and boreholes there is often a need for
putting down different equipment and collect measured data.
For this purpose pulling tools of different embodiments are
10 used, having wheels or chains that roll on the wall of the
pipe or borehole. The rollers or the chain are/is pressed
against the wall of the pipe/borehole with a force sufficient
to achieve the desired axial propulsive force in varying
frictional conditions. The supply of power is effected
15 through a cable connection to the surface.

An optimum pulling tool must be formed to be able to negoti-
ate restrictions and sharp curvatures without getting stuck.
In order to achieve these important functions, a solution has
been reached in the present invention, which makes it possi-
20 ble in a simple and robust way to meet these functional re-
quirements. To achieve this object the pulling tool is pro-
vided with 3 axially longitudinal chains, offset 120 degrees

relative to each other viewed in a section perpendicular to the longitudinal axis. The chains run on longitudinal links which are interlocked, so that the radial movement will be the same for all three chains when they are moved radially.

5 With this construction is achieved that the pulling tool is always kept centred within a pipe or a borehole. This is a condition for allowing efficient positioning of equipment and operation of measuring tools.

10 A limitation in the length of the tool is achieved by all three links with chains being arranged in such a way that they have a radial movement out from the centre. In addition, the links are arranged 120 degrees offset relative to each other and with the same extent longitudinally. In most other known structures the pulling devices are arranged one behind
15 the other, which makes the pulling tool long and unsuitable in sharp curvatures. In boreholes which have not been lined with steel pipes, the walls are often rough and it is difficult for wheels to achieve sufficient grip. In such events the use of chains would be advantageous.

20 Most known pulling tools utilize electric/hydraulic operation. This means that an electric motor drives a hydraulic pump, which again supplies power to hydraulic motors in the driving wheels. Such a system will be technically complex and low efficiency is achieved. With a limited supply of power
25 through long cables, this will limit the traction substantially. In several operations great tractive power is desirable. In the present invention propulsion is effected through direct electric drive, without the use of hydraulics. Thereby a substantially higher performance is achieved for the pulling
30 tool.

The invention will now be explained in further detail in connection with a description of an exemplary embodiment and with reference to drawings, in which:

Figure 1 shows the pulling tool with chains and links in the extended position;

Figure 2 shows section A-A through a link with chain guides;

Figure 3 shows a chain detail;

5 Figure 4 shows the mounting of links;

Figure 5 shows a detail of the mounting for links;

Figure 6 shows a detail of a drive arrangement for chains;

Figure 7 shows a section of a borehole with the pulling tool in an extended position against the wall of the borehole.

10 The main structure of the tool consists of an elongate, cylindrical element (1). To this cylindrical element are arranged links (2), (4) and (5) connected with linkages (6). The links can be moved radially in milled grooves (11) in the main element (1) in such a way that the links (2) are forced
15 against the borehole wall (20) in a position parallel to the longitudinal axis of the main part (1). Radial displacement of the links (2) is brought about by the terminal element (9), to which the links (5) are connected, being moved axially. To obtain the greatest possible radial force against
20 the borehole wall, the links (5) are terminated at the terminal element (9) through the bolt (12) in a bolt hole (10) at a distance (14) on the opposite side of the centre line (13). A corresponding termination is made for all three end links (5) placed 120 degrees offset from each other. Axial movement
25 for the activation of the links (5) through the terminal element (9) is effected by an actuator (24) and a spring element (7) placed between the actuator and the terminal element (9). The supply of energy to the actuator and the driving of the

chains (3) is effected through a cable connection (23) from the surface.

The chain (3) is made up of side links (21) with rollers (22) held in place by through bolts (26). The chain runs in milled
5 grooves (27) in the links and across pulleys (25) and driving wheels (15).

The driving of the chains (3) is provided by three chain wheels (15) arranged to a bevel gear (17) engaging the bevel gear (18) connected to the shaft (19). The shaft (19) commu-
10 nicates with the electric motor (8), so that the electric motor is mechanically connected to the chain wheel (15) for direct mechanical drive of the chains (3).

C l a i m s

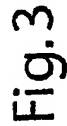
1. A pulling tool for use in pipelines and boreholes including an elongated body (1) and at least one in relation to the centre axis (13) of the elongated body (1) radially displaceable first link (2), the first link (2) being substantially parallel to the centre axis (13), in that a chain (3) which constitutes a propulsion chain, is located between the first link (2) and the borehole wall (20), and where one end party of the first link (2) is hingedly connected to the elongates body (1) by a second link (4), and where the opposite end portion of the first link (2) is hingedly connected to the elongates body (1) by a third link (5) and an in relation to the elongated body (1) axially displaceable terminal element (9), characterized in that a hinge pin (12) connecting the third link (5) to the terminal element (9) is positioned on the opposite side of the centre axis (13) relative the first link (2).
2. Pulling tool as described in claim 1, characterized in that the terminal element (9) is connected to a preloaded spring element (7) whereby the first link (2) is preloaded towards the borehole wall (20) through the third link (5).

AMENDED SHEET

A B S T R A C T

A pulling tool for use in the placing of equipment and acquisition of data from pipes and boreholes used in the production of oil and gas. For this purpose the tool is constructed
5 round a central, elongate, cylindrical main element (1) to which there are arranged radially movable links (2), (4) and (5) with chains (3) arranged thereto, running in grooves (11). Radial movement of the links is provided by subjecting a terminal element (9) for the links (5) to an axial movement
10 by means of an actuator (24). The chains (3) are rotated by an electric motor (8) transferring, through the axle (9) connected to the bevel gears (18) and (17), propulsive force to the chain wheel (15) on which the chains (3) are running.

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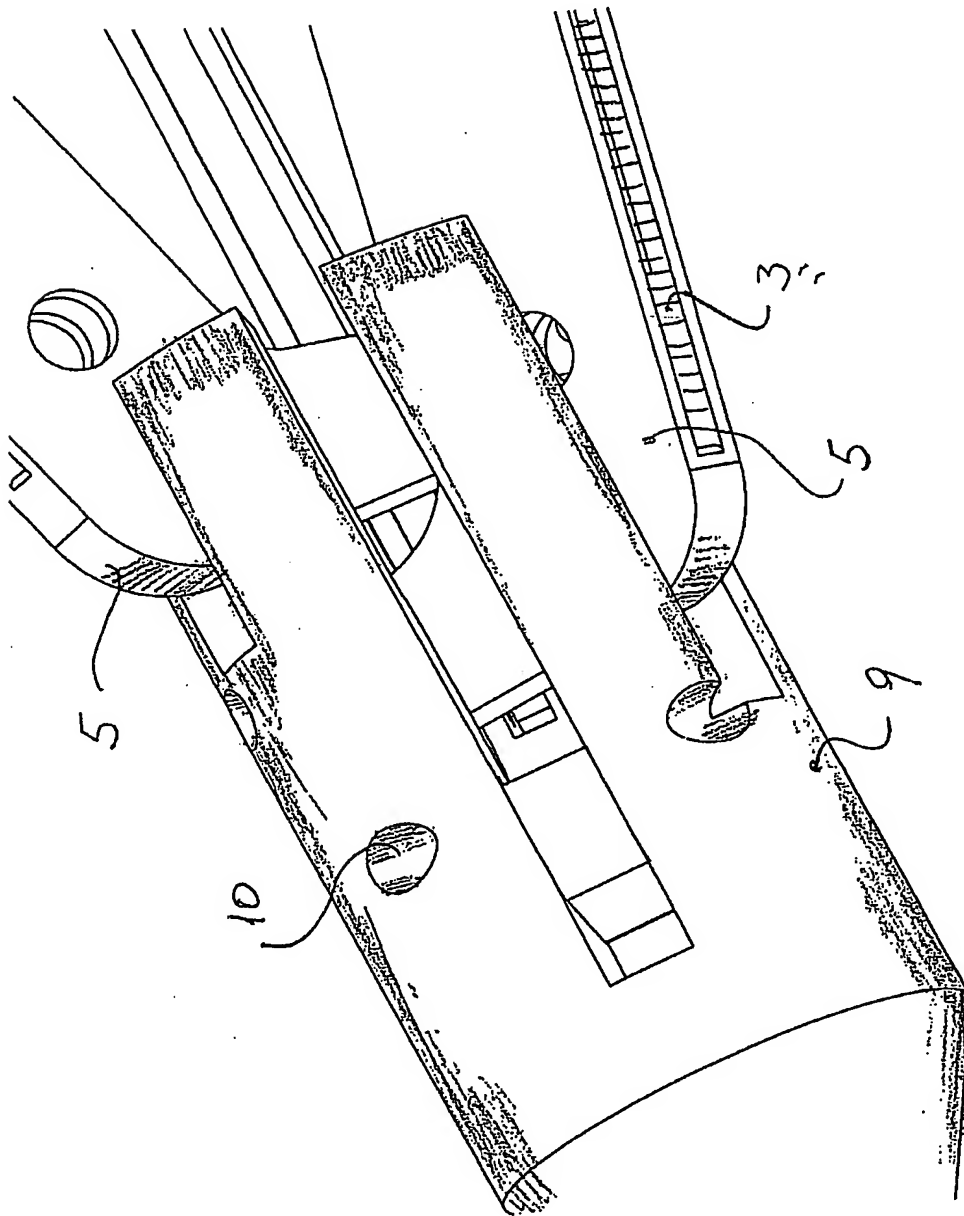


A DEVICE FOR A PULLING TOOL FOR USE IN PIPES AND BOREHOLES
FOR THE PRODUCTION OF OIL AND GAS (as amended)

Inventor(s): Geir Ueland et al.
Attorney Docket No. 1935-00166

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A DEVICE FOR A PULLING TOOL FOR USE IN PIPES AND BOREHOLES
FOR THE PRODUCTION OF OIL AND GAS (as amended)

Inventor(s): Geir Ueland et al.
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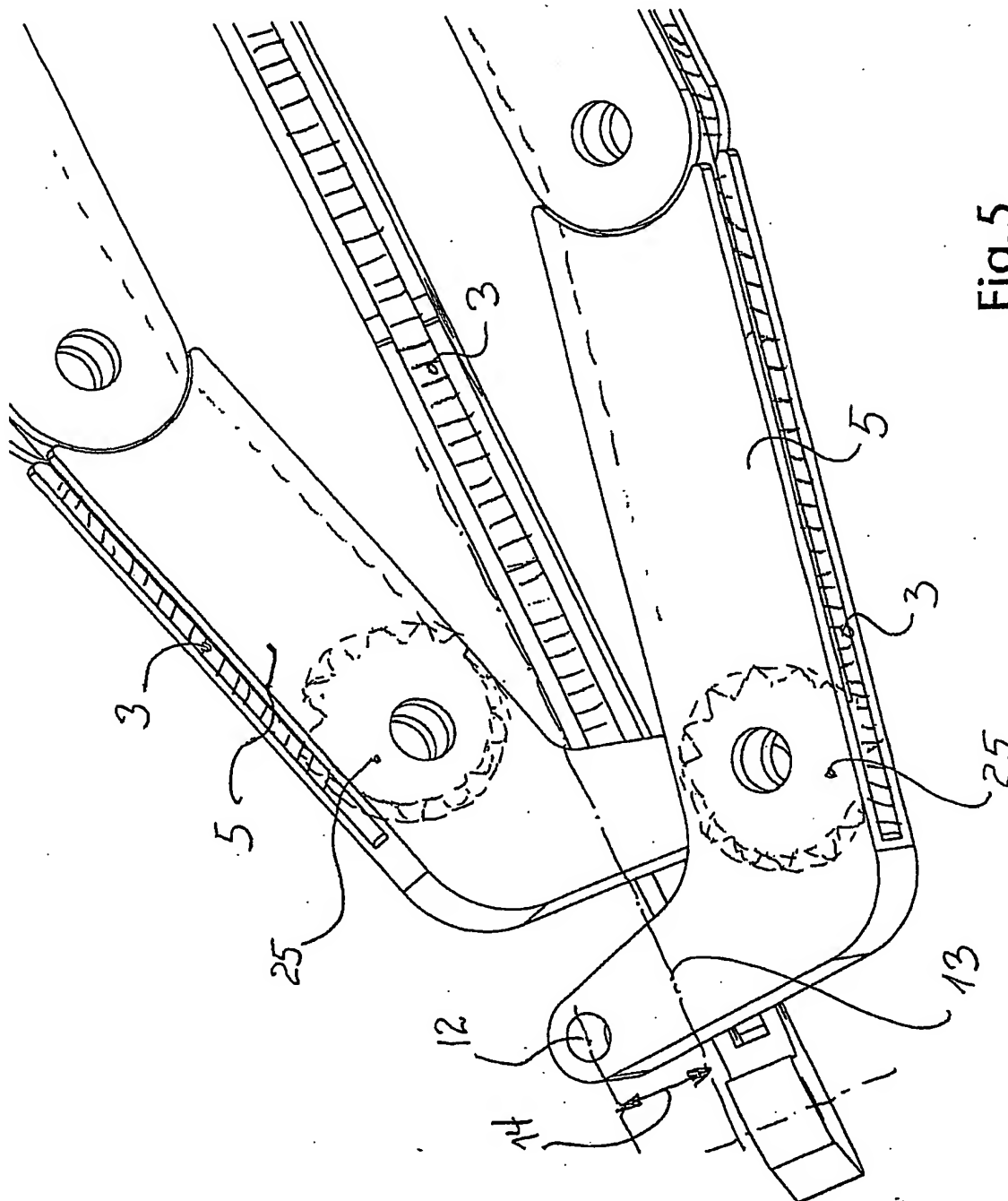
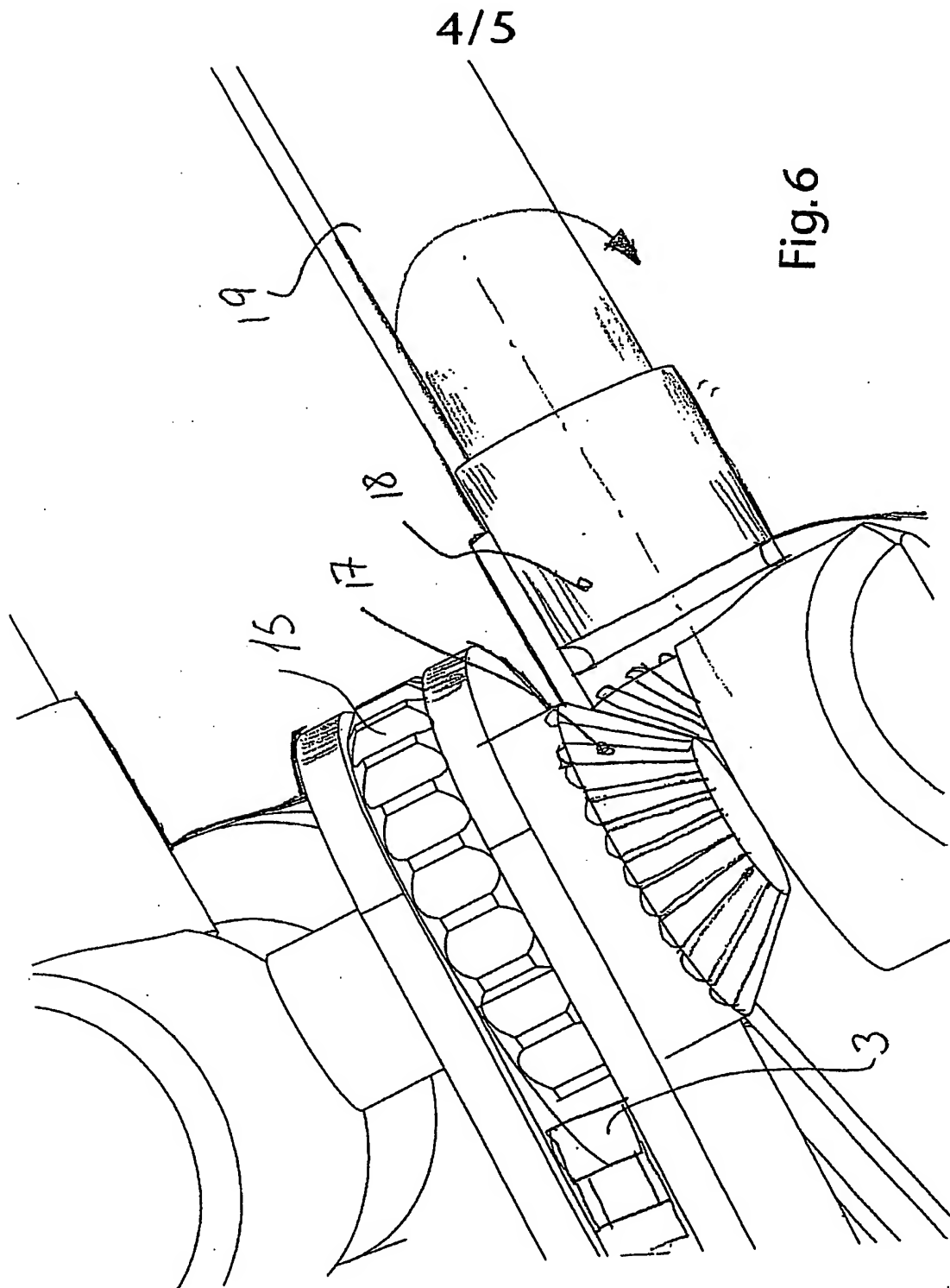


Fig. 5

A DEVICE FOR A PULLING TOOL FOR USE IN PIPES AND BOREHOLES
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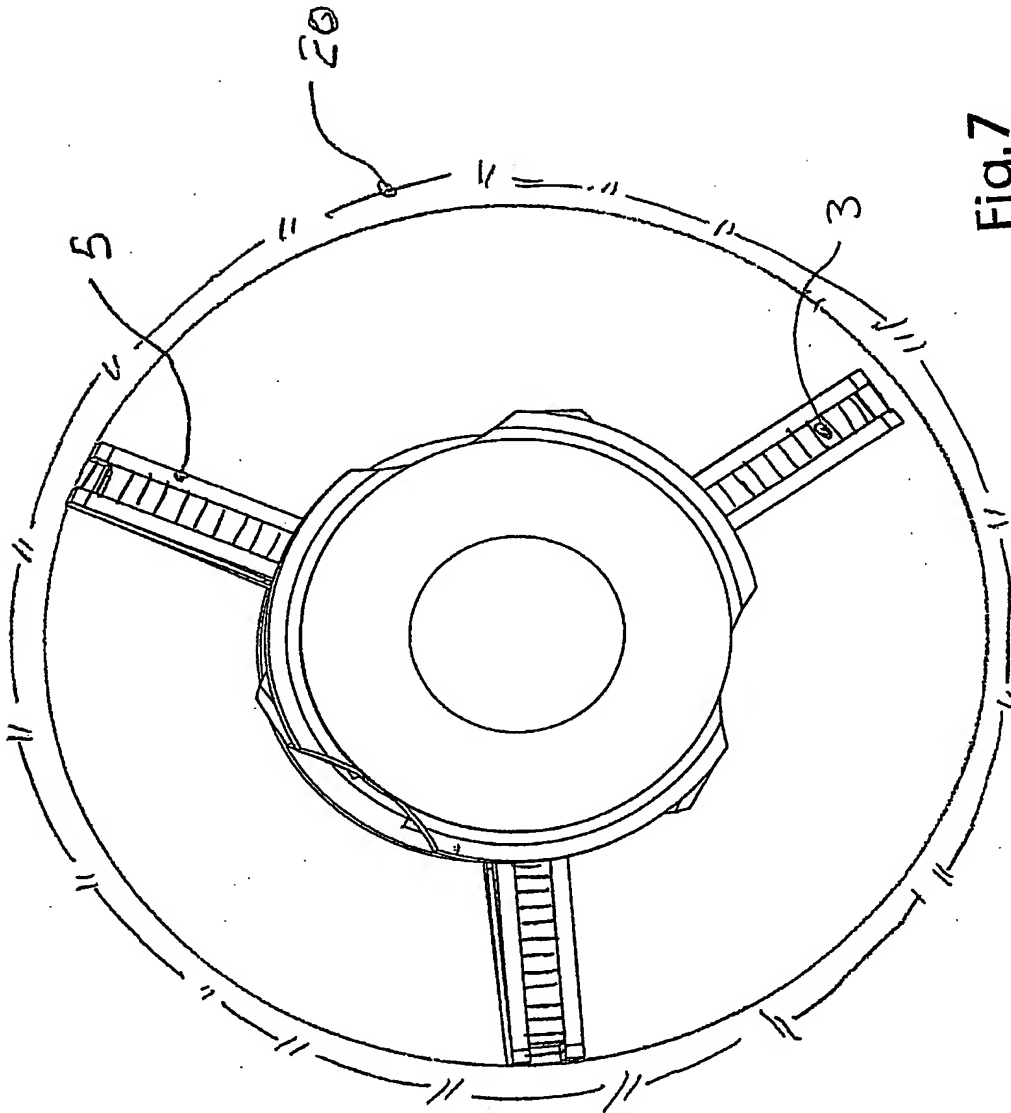


A DEVICE FOR A PULLING TOOL FOR USE IN PIPES AND BOREHOLES
FOR THE PRODUCTION OF OIL AND GAS (as amended)

Inventor(s): Geir Ueland et al.
Attorney Docket No. 1935-00166

10/541110

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 2004/000022

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E21B 23/00, F16L 55/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E21B, F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2742259 A (C.E. BOUCHER), 17 April 1956 (17.04.1956), whole document	1,2
Y	--	3
X	US 4670862 A (P. STARON ET AL), 2 June 1987 (02.06.1987), whole document	1,2
Y	GB 109021 A (J.E. GLEASON ET AL), 30 August 1917 (30.08.1917), whole document	3
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☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

31 August 2004

Date of mailing of the international search report

08-09-2004

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INTERNATIONAL SEARCH REPORT

Information on patent family members

31/07/2004

International application No.

PCT/NO 2004/000022


US 2742259 A 17/04/1956 NONE

US	4670862	A	02/06/1987	AU	571646	B	21/04/1988
				AU	3865385	A	22/08/1985
				BR	8500731	A	08/10/1985
				CA	1228910	A	03/11/1987
				DE	3561084	D	00/00/0000
				EP	0156660	A,B	02/10/1985
				FR	2559913	A,B	23/08/1985
				IN	163985	A	24/12/1988
				IT	1183358	B	22/10/1987
				IT	8519540	D	00/00/0000
				MX	158275	A	18/01/1989
				NO	163716	B,C	26/03/1990
				NO	850601	A	19/08/1985
				OA	7954	A	31/01/1987

GB 109021 A 30/08/1917 NONE

PCT REQUEST

Original (for SUBMISSION)

0	For receiving Office use only	PCTNO 04 00022
0-1	International Application No.	
0-2	International Filing Date	26 JAN. 2004 (26.01.04)
0-3	Name of receiving Office and "PCT International Application"	 PATENTSTYRET <small>Statens forvaltning for industriell eiendom</small> PCT International Application
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared Using	PCT-SAFE [EASY mode] Version 3.50 (Build 0002.150)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	Norwegian Patent Office (RO/NO)
0-7	Applicant's or agent's file reference	P 24508 PC
I	Title of Invention	A PULLING TOOL DEVICE FOR USE IN TUBULARS AND BOREHOLES FOR OIL- AND GAS PRODUCTION
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name:	CHAIN TRAIN
II-5	Address:	Fabrikkveien 29 4033 STAVANGER Norway
II-6	State of nationality	NO
II-7	State of residence	NO
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	UELAND, Geir
III-1-5	Address:	Nonsberggtunet 11 4050 SOLA Norway
III-1-6	State of nationality	NO
III-1-7	State of residence	NO

PCT REQUEST

Original (for SUBMISSION)

III-2	Applicant and/or inventor	applicant and inventor
III-2-1	This person is:	US only
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	MELLEMSTRAND, Jone
III-2-5	Address:	Solavegen 513 4354 VOLL Norway
III-2-6	State of nationality	NO
III-2-7	State of residence	NO
IV-1	Agent or common representative; or address for correspondence	agent
	The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	
IV-1-1	Name:	HÅMSØ PATENTBYRÅ ANS
IV-1-2	Address:	P.O. Box 171 4302 SANDNES Norway
IV-1-3	Telephone No.	+47 51 66 20 20
IV-1-4	Facsimile No.	+47 51 66 18 96
IV-1-5	e-mail	patent@hamso.no
V	DESIGNATIONS	
V-1	The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.	
VI-1	Priority Claim	NONE
VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)
VII-2	Request to use results of earlier search; reference to that search	
VII-2-1	Date	28 October 2003 (28.10.2003)
VII-2-2	Number	20024227
VII-2-3	Country (or regional Office)	NO

PCT REQUEST

Original (for SUBMISSION)

VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	number of sheets	electronic file(s) attached
IX-1	Request (including declaration sheets)	4	-
IX-2	Description	2	-
IX-3	Claims	1	-
IX-4	Abstract	1	✓
IX-5	Drawings	5	-
IX-7	TOTAL	13	
	Accompanying Items	paper document(s) attached	electronic file(s) attached
IX-8	Fee calculation sheet	✓	-
IX-9	Original separate power of attorney	✓	-
IX-17	PCT-SAFE physical media	-	✓
IX-19	Figure of the drawings which should accompany the abstract	5	
IX-20	Language of filing of the international application	Norwegian	
X-1	Signature of applicant, agent or common representative		
X-1-1	Name (LAST, First)	HÅMSØ PATENTBYRÅ ANS	
X-1-2	Name of signatory	Gunnar Håmsø	
X-1-3	Capacity	Attorney at Law	